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US Doc No. S-6

Copy No. 26

SOVIET GROSS NATIONAL PRODUCT, 1960-1975

This intelligence report was prepared as part of the US contribution to a NATO study comparing economic trends in the Free World and the Sino-Soviet bloc. Other parts of the US contribution concerned with the USSR are: S-4, Manpower and Physical Production and S-5, Soviet GNP: 1950-1960.

September 12, 1956

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SOVIET GROSS NATIONAL PRODUCT, 1960-1975

A. Summary

The projections of Soviet GNP to 1975 presented in Tables 1 and 2 indicate a rate of growth approximating that estimated for the Soviet economy during the decade of the Fifth and Sixth Five Year Plans. Expressed in 1953 ruble prices at factor cost,* it is estimated that by 1975 Soviet GNP will increase to almost 4,200 billion rubles. An alternative estimate, in the same terms but using a somewhat different approach, yields almost identical results.** The computed results for total GNP in both estimates implies an average annual rate of increase of 7 percent; however this future growth will not be distributed smoothly over the entire period. Smaller additions to the labor force, which the USSR will experience during the Seventh and Eighth Five Year Plans, will impose some constraint upon the ability of the Soviet economy to grow from 1960 to 1970, but by 1975 it appears likely that the additions to the labor force will more closely approach those of the Fifth and Sixth Five Year Plan periods and thus alleviate somewhat this constraint upon economic growth.

Differential growth rates among the various uses of the national product will result in a very different end use pattern in 1975 (1953 prices) from that estimated for 1960. Consumption declines from 57 percent

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* See US Document S-5. The implication of the use of 1953 ruble prices in the projection is discussed in Section C below.

** See Appendix A.

[redacted]

of GNP in 1960 to 46 percent in 1975, while investment increases its share from 30 percent to 44 percent. Defense expenditures decline moderately as a proportion of the national product, though they more than double in absolute size between 1960 and 1975.

The indicated increase in aggregate consumption will permit an increase of almost 65 percent in per capital consumption or about 3.5 percent per year for the fifteen year period. The very large growth of investment implies that the capital stock of the Soviet economy will more than quadruple in the 15-year period. By 1975, the capital stock in industry, the major recipient of investment, will be almost 5 times the 1960 level, and the capital stock in agriculture will be more than 5.5 times the 1960 level.

As in the 1950-60 period, there are also different growth rates for the sectors originating the Soviet national product. The industry sector (including transportation, communication and construction) with its far greater weight dominates the growth picture from 1960 to 1975. More than tripling over the 15 year period, this sector increases its contribution to GNP from 56 percent of the total to 69 percent. Agriculture, on the other hand, lagging well behind the growth of the economy as a whole, shows a decline in its contribution to GNP from 24 percent of the total in 1960 to 13 percent in 1975. The service sector as a whole also shows a decline as a percentage of total GNP, but because of the greater urbanization expected in the next two decades housing and municipal services grow more rapidly than any of the other sectors of origin.

The ruble figures for Soviet GNP by end-use were converted to 1955 market dollars by essentially the same method as that used for conversion of ruble GNP figures for the period 1950-1960.* The resulting dollar figures, using a Soviet product mix, are presented in Table 3. Similar figures for the use categories, converted by using the ruble-dollar ratios based on the 1955 US product mix, are presented in Table 4; however, no dollar figures for total GNP in this case were calculated, since the use of a 1955 US product mix is somewhat questionable for the year 1960 and certainly inappropriate for so distant a time as 1975.

No conversion of Soviet GNP by sector of origin was attempted because the available price data are insufficient to calculate appropriate ruble-dollar ratios for sectors of origin. While no quantitative estimates can be given, it appears that the services component expressed in dollars would be a somewhat higher percentage of total GNP than that indicated in the ruble calculation. Consequently, either the industry or agriculture components, or both, would constitute a smaller proportion of GNP expressed in dollars.

* See US Doc S-5, pp. 2, 15-20.

TABLE 1

SOVIET GNP BY END-USE, AT RUBLE FACTOR COST, 1960-1975

	1960	1965	1970	1975
A. Billion 1955 Rubles				
Consumption*	866	1120	1461	1923
Investment	462	745	1166-	1855
Defense	192	246	313	399
TOTAL GNP	1520	2111	2940	4177
B. Index (1960-100)				
Consumption*	100	129.5	168.9	222.3
Investment	100	161.3	252.4	401.5
Defense	100	128	163	208
TOTAL GNP	100	139.0	193.5	275.0
C. Index Each Five Years				
Consumption*	-	129.5	130.4	131.6
Investment	-	161.3	156.5	159.1
Defense	-	128.0	128.0	128.0
TOTAL GNP	-	139.0	139.3	142.1
D. Percentage Distribution				
Consumption*	57.0	53.0	49.7	46.0
Investment	30.4	36.3	39.7	44.4
Defense	12.6	11.7	10.6	9.6
TOTAL GNP	100.0	100.0	100.0	100.0

* Includes government administration, shown separately in the estimates for the period 1950-1960 given in US Document S-5.

Table 2

SOVIET GNP, SECTORS OF ORIGIN, 1960-1975

	1960	1965	1970	1975
A. Billion 1953 Rubles				
Industry*	850	1,299	1,927	2,895
Agriculture	360	418	482	562
Housing and Municipal Services**	37	56	87	135
Trade**	101	138	194	275
Other Services**	172	200	250	310
Total GNP	1,520	2,111	2,940	4,177
B. Index (1960=100)				
Industry*	100	153	227	341
Agriculture	100	116	134	156
Housing and Municipal Services**	100	151	235	364
Trade**	100	137	192	272
Other Services**	100	116	145	180
Total GNP	100	139	194	275
C. Index Each Five Years				
Industry*	-	153	148	150
Agriculture	-	116	115	117
Housing and Municipal Services**	-	151	155	155
Trade**	-	137	140	142
Other Services**	-	116	125	124
Total GNP	-	139	139	142
D. Percentage Distribution				
Industry*	56.0	61.5	65.5	69.4
Agriculture	23.7	19.8	16.4	13.4
Housing and Municipal Services**	2.4	2.6	3.0	3.2
Trade**	6.6	6.6	6.6	6.6
Other Services**	11.3	9.5	8.5	7.4
Total GNP	100.0	100.0	100.0	100.0

* Includes construction and transportation-communications.
** These three sectors combined are comparable to "Trade and Services" in US Document S-5.

TABLE 3

SOVIET GNP BY END USE, 1960, 1965, 1970, and 1975

(Computed in dollar market prices, using Soviet product mix)

	1960	1965	1970	1975
A. Billion 1955 dollars				
Consumption	130.4	168.9	220.2	289.9
Defense	50.7	64.9	82.6	105.4
Investment	69.9	112.7	176.4	280.6
Total GNP	251.0	346.5	479.2	675.9
B. Index (1960 = 100)				
Consumption	100	130	169	222
Defense	100	128	163	208
Investment	100	161	252	401
Total GNP*	100	128	191	269
C. Percent				
Consumption	52	49	46	43
Defense	50	19	17	16
Investment	28	32	37	41
Total GNP	100	100	100	100

* The dollar values in this table were derived by applying the appropriate sector dollar-ruble ratio to the ruble value of the end use components for each year. The somewhat slower rate of growth of the dollar total, as compared with the ruble total shown in Table 1, results from the different component weights which are implicit in this procedure as compared with the factor cost ruble weighted GNP index.

Table 4

SOVIET GNP BY END USE, 1960, 1965, 1970, and 1975

(Computed in dollar market prices, using US product mix)

	1960	1965	1970	1975
A. Billion 1955 dollars				
Consumption	93.0	120.9	157.2	206.5
Defense	46.1	59.0	75.1	95.9
Investment	57.7	92.9	145.4	231.4
Total GNP*	(159.2)	--	--	--
B. Index (1960 = 100)				
Consumption	100	130	169	222
Defense	100	128	163	208
Investment	100	161	252	401
Total GNP*	--	--	--	--

* A dollar-ruble ratio for the total GNP requires US weights for the three categories of end use. The absence of these weights prevents the calculation of a total dollar-ruble ratio for the years after 1960. For the same reason, no percentage breakdown can be given. See footnote to Table 4, p. 6, US Document S-5.

B. Basic Assumptions

For the purposes of the projection presented in this report, the following basic assumptions were made: (1) There would be no "hot" war during the period of the projection, nor would the USSR convert its economy for a full-scale war during this period. (2) The basic institutional structure of the Soviet economy would remain unchanged. (3) Rapid economic development, particularly of heavy industry, would remain a primary Soviet objective. It should also be noted that specific account of Soviet foreign trade was omitted in calculating the future size and composition of Soviet GNP. Extensive Soviet activity in foreign trade markets, especially a marked increase in trade with non-bloc countries, would substantially alter the growth pattern from that indicated in this report.

Within the basic frame of reference, the allocation of resources could vary from that assumed for the purposes of this calculation. For example, consumption (including administration) is estimated to grow at a rate one percent less than the rate of growth of GNP, but a more rapid growth would be consistent with the basic assumptions enumerated above as long as this rate of growth remained less than that of investment. Similarly, defense is assumed to grow at 5 percent per year, but might increase at a slower or faster rate. The growth rates of the use-categories actually used in this projection conform roughly to the experience of the 1948-55 period and to the trends indicated by the Sixth Five Year Plan.

They are consistent with an economic policy placing primary emphasis on economic growth, but permitting the maintenance of a high state of military preparedness, and relying on real income incentives rather than on force to stimulate labor productivity. The projected rate of growth would be the same if allocations to defense were somewhat reduced and allocations to consumption correspondingly increased; however, it would be greater if allocations to investment were increased out of either defense or consumption.

C. Technique of Projection

The projection the Soviet National Product presented here is the product of the solution of a two equation model. The first equation refers to the generation of GNP and is expressed: $Y_t = P_t + A_t + S_t$, where Y_t is GNP in year t, P_t is the industry contribution, A_t is the agricultural contribution, and S_t the services contribution. The second equation presents the distribution of GNP among the end uses and is expressed as: $Y_t = C_t + D_t + I_t$, where Y_t is again GNP in the year t, C_t is the amount allocated to consumption, D_t the amount allocated to defense and, I_t the amount allocated to investment. The simultaneous solution of these two equations for the year in question results in GNP for that year.

The prices employed to value the Soviet product for the purposes of this projection are ruble prices of 1953. The use of these prices for an economy undergoing such rapid growth limits the usefulness of the results

for intertemporal and international comparison. Changing price relations, which will come about as a result of growth itself, will undoubtedly have a deceleration effect upon the calculated rate of economic growth. Moreover, compared with the growth of more balanced economies, it is likely that changing price relations in the USSR will exert a relatively greater decelerating influence on the statistical measurement of future Soviet GNP.

In estimating the GNP for any year, the first step was the calculation of the output of the industrial, agricultural, and service sectors.* This procedure automatically gave a breakdown by sector of origin, but involved making subsiderary estimates of both input and output indicators. Once the GNP was computed for any year, it was broken down by use-category by computing aggregate consumption and defense expenditures in accordance with the assumption mentioned above, and deriving investment as a residual. Given the assumption that military expenditures will increase about 5 percent per annum, it would be equally appropriate to estimate investment independently and derive consumption as a residue. The latter procedure was used in the alternative calculation described in Appendix A.

* Throughout this discussion, the "industrial"sector includes (in addition to manufacturing and mining) construction, transportation and communications; the "services" sector includes housing, municipal services, trade, and all other services.

D. Calculation of Future Soviet GNP

1. Industrial Sector (P_t)

The future output of the industrial sector depends on the expected growth of the inputs of labor and capital and on productivity changes. The relationship between computed output and these factors was assumed to be a production function comparable in form to the Cobb-Douglas function, viz. $P_t = L_t^{(a)} \cdot K_t^{(b)} \cdot E_t$*. Imputed coefficients of 60 percent for labor and 40 percent for capital were used since (1) most of the actual shares for industry in the US and other countries as estimated by Douglas were between 60-40 and 70-30, and (2) the results of a multiple correlation applied to labor and capital in relation to Soviet industrial output for the 1928-55 period gave approximately the same results. Although capital is likely to have a smaller importance in construction than in industry proper, it has certainly a much greater one in transport. The 60-40 set of coefficients was therefore applied to the broader industrial category as a component of GNP. The estimated values of the variables L, K, and E,

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* In this equation, for any given year (t), the variables P, L, K and E are as follows:

P_t is an index of industrial output.

L_t is an index of labor in units of constant quality.

K_t is an index of capital stock in constant prices.

E_t is the ratio between the output index and the indexes of labor and capital combined, and represents all factors which affect the growth of output but are not measured as part of labor and capital.

The exponents (a) and (b) represent constant imputed shares of labor and capital in output. The sum of (a) and (b) is equal to unity. The use of a function with constant exponents involves an assumption that marginal productivity of capital relative to that of labor declines proportionately to the increase in capital per worker.

Table 5

STATISTICAL ESTIMATE OF FACTORS

DETERMINING THE INDUSTRIAL COMPONENT OF SOVIET GNP, 1960-1975

	1960	1965	1970	1975
A. Industrial Labor Force (L_t)				
Size: millions of persons	34	39	47	57
Size: index (1960=100)	100	116	138	168
Size: index each five years	-	116	119	122
Quality: index (1960=100)	100	110	119	126
Quality: index each five years	-	110	108	106
B. Capital Stock (K_t)				
Amount: billion 1953 rubles	1,220	2,155	3,632	5,877
Amount: index (1960=100)	100	177	298	482
Amount: index each five years	-	177	168	162
C. Efficiency (E_t)				
Index (1960=100)	100	105	110	115
Index each five years	-	105	105	105
D. Computed Ratios				
Capital/Output:ratio	1.44	1.66	1.88	2.03
Capital/Output: (1960=100)	100	115	130	141
Net Increm.Cap./Increm Output	-	2.08	2.35	2.32
Output/Worker: 1953 rubles	2,512	3,314	4,126	5,097
Output/Worker: 1960=100	100	132	164	203
Capital/Worker: 1953 rubles	3,600	5,500	7,800	10,300
Capital/Worker: 1960=100	100	153	217	286

together with certain ratios, are shown in Table 5.

a. Labor force. The total labor force in the USSR is estimated to grow less rapidly in the period 1960-1975 than in the decade 1950-1960. This slower rate of growth will be due to the following factors: (1) Smaller increments to the population of employable age. (2) A continued increase in school, especially high school and university enrollments, though at a slower rate than in the 1950-60 period; this will reduce child labor and the participation in the labor force of persons in their late teens and early twenties. (3) An equalization of the sex ratio -- women of marriageable age now greatly exceed men -- which will probably result in a higher marriage rate for women, and, in consequence, a decline in the participation of women in the labor force. (4) Continued urbanization and possibly reduced necessity to work as living standards rise, which may reduce the participation of both women and old men in the labor force.

Taking these factors into account and assuming a very slight decline in the agricultural labor force during the period 1960-65, it is estimated that the industrial labor force will increase by about 3 percent per year in this quinquennium. For later years, the industrial labor force was derived as a residue -- the agricultural labor force was assumed to decline about 1.5 percent per year in 1965-70 and 2.5 percent per year in 1970-75; the resulting non-agricultural labor force increased 2.5 percent per year in both periods and the derived industrial component thereof grew at 3.5 percent per year in 1965-70 and at about 4 percent per year in

1970-75.* These additions to the industrial labor force could be transfers from the agricultural sector. This appears to be well within Soviet capabilities given the large allocations of investment to agriculture which are expected to be made. However, it could also be effected from new entrants to the labor force without drawing on older persons currently employed in agriculture, many of whom whould probably be difficult to train for industrial positions.

The quality of labor, and therefore its productivity, tend to grow with improvements in educational levels and technical skill. The great strides which have been made in the field of general and technical education in the USSR since the 1920's are believed to have had a major effect on the growth of the economy, particularly in industry. Present Soviet plans are to make 10-year education compulsory by 1960. On the basis of enrollment, graduation, and population trends, the distribution of the adult Soviet population by highest level of school reached was estimated for selected years and projected to 1975. It was assumed that the relative average productivity of workers which have completed the various levels of formal education and training is roughly proportional to the average wage expectancy of each educational group. An index of labor

* Some of the labor force, notably forced labor, is not accounted for in the above national categories. Inclusion of forced labor would slightly reduce the percentage growth of the labor force, especially in the industrial sector,

quality as related to education was computed by weighting the percent of the adult population in each educational group by the estimated average wage expectancy of workers in each group. It is reasonable to expect a lag between graduation from school and the fullest utilization of this newly acquired knowledge. In the U.S., higher levels of education are fully reflected in higher wages 10-15 years after graduation. Accordingly, the growth of labor productivity attributable to education during each 5 year period was assumed to equal the average rate of growth of educational attainment during both this period and the preceding 5 years. In other words, this aspect of labor productivity was related to a 10 year moving average of educational attainment.

b. Capital Stock. In any future year, the capital stock depends on the capital stock in the base year, on gross investments between the base year and the future year, and on retirements of capital assets during this period. Fixed capital assets only are considered in this context. It is estimated that about 70 percent of gross investment consists of fixed capital; the remainder is principally capital repairs (which tend to grow faster than capital investment) and increases in inventories (which tend to grow more slowly).

In determining the amount of gross capital investment in the industrial sector, it was assumed that 55 percent would be allocated to this sector, 20 percent to agriculture, 15 percent to urban housing and municipal services, and 10 percent to other services. These shares appear to have varied but little during the entire period since 1928; the projected share of the industrial sector and of housing and municipal services is slightly

higher than during the Fifth and Sixth Five Year plans, while the share of agriculture is lower than in the recent past and immediate future but higher than before World War II.

Retirements were calculated on the basis of U.S. analogy and on the postwar relation between gross capital investment and the growth of fixed capital stock in the USSR.* Assuming an average lag of one year between investment and the resulting increment to capital stock, actual retirements during the Fourth Five Year Plan appear to have been much smaller than the amounts as calculated, but about the same during the Fifth Five Year Plan. However, given the pressures of the reconstruction period, this result is not surprising.

c. Efficiency. For purposes of this projection, all factors which determine the level of economic activity other than labor, the quality of labor, and the stock of fixed capital are treated aggregatively by the factor called "efficiency." This includes the net effect on output of such elements as: (1) The rate of technological change, which is in turn influenced by engineering and scientific research, the availability of investment, the number of trained personnel, and the ability to borrow

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* Retirement assumptions for the industrial sector, expressed as a percent of original cost per five year period, are as follows:

From stock existing in 1945:		15%
From increments to stock, of age:	0 - 5 years:	0%
	6 -10 years:	7%
	11-15 years:	12%
	16 -20 years:	12%
	21 -25 years:	10%
	26 -30 years:	8%

technology from abroad. (2) Economies of scale as production grows and becomes more specialized. (3) Diminishing returns to fixed factors, especially agricultural land and mineral resources. (4) Gains from foreign trade. (5) Improvements in planning, the organization of production, and financial control; or conversely losses and inefficiencies due to ill advised institutional changes and plans. (6) Worker and managerial morale and incentives as affected by living standards, wage scales, attitudes toward the regime, etc.

An appraisal of the manner in which these complex and often conflicting elements will affect Soviet output in the future is necessarily very speculative; moreover, historical experience provides a poor guide because of the many uncertainties involved in calculating Soviet capital stock in constant prices. If reasonable assumptions are made regarding capital stock in the USSR since 1928, it appears that there was a sharp decline in efficiency during the early 1930's (when there was an extremely large inflow of unskilled labor), followed by a sharp rise from 1934 to 1936, a drop in 1937 at the time of the purges, and a leveling off until the war. Since World War II, efficiency has followed an upward trend, except for a temporary leveling off in the 1951-53 period. Starting from a very low level, due probably to the poor condition of plant and the large use of marginal labor and overtime work, efficiency increased by about 20 percent from 1948 to 1955, and reached the 1940 level in the latter year. Half of this increase was prior to 1950. Fulfillment of the Sixth Five-Year Plan would require another increase of approximately 10 percent in efficiency by 1960; this would raise the level of efficiency to the

highest point in Soviet experience to date (viz. the 1936 level). Further increases in efficiency after 1960 are considered likely, though at a less rapid rate than that indicated for the immediate postwar years. For simplicity, the percentage increase for each five year period after 1960 was assumed to be constant.

2. Agricultural Sector (A_t)

Agricultural production is estimated to increase by 3 percent a year after 1960, or roughly one percent a year faster than population. This is close to the minimum growth compatible with continued self-sufficiency; on the other hand, a significantly higher growth rate would probably entail very high and possibly increasing costs. Substantial increases in yields in certain areas may result from the greater use of fertilizer and the planting of hybrid corn, crop losses could be cut through further mechanization, and increases in the value of production could result from a greater concentration on livestock products, but it is evident that climatic and soil conditions are far less favorable for long-run expansion of agricultural production in the USSR than they have been in the US. In addition, most of the arable land is already being intensively cultivated.

The inability of the USSR to raise per capita agricultural production to any significant degree in the past can be partly attributed to low investment prioritiesin this sector, to the destruction of agricultural assets (notably livestock) during the early 1930's, and to losses sustained in World War II. Recently there has been a considerable shift of prioritied in favor of agriculture. The agricultural share of investment allocations has risen, as has the labor force employed in agriculture, especially in

the skilled categories. Continuation of such a policy would probably, however, act as a severe drag on the economy, since labor is much more productive outside agriculture and capital yields in other areas are less subject to the restraints imposed by a relatively fixed factor of production (i.e., land).

There is a great deal of uncertainty regarding the effectiveness of alternative agricultural policies in the USSR, but it seems likely that some reduction in the agricultural labor force will occur and possibly an increase in agricultural imports rather than a disproportionate increase in investment allocated to this sector. The projected share of agricultural investment is close to the 1928-55 average and would, barring wholesale destruction of livestock by peasants in the event of drastic changes in institutions, result in a substantial growth in the stock of agricultural capital. Whether the USSR will in fact follow this course of action is uncertain, but the projected investment allocations to agriculture are believed to be sufficient to permit the estimated increase in production and decline in labor force.

3. Services Sector (S_t)

This sector was subdivided into three components because of their differing relation to inputs. (a) Rent and Utilities services were assumed to grow proportionately to urban housing space; the growth of urban housing space was estimated by valuing the existing stock of housing and utilities, adding investments in housing and municipal services, and deducting estimated retirements. (b) Trade services were assumed to increase with the GNP. Trade turnover will certainly increase faster than

consumption because it involves only consumption of goods, which tend to grow faster than consumption of services, and also because an increased percent of consumer goods production is marketed as urbanization progresses.

(c) Other services are assumed to grow at approximately 4 percent per year. This corresponds to a yearly rate of increase of 2.5 percent in employment and 1.5 percent in labor productivity; the latter productivity allowance is intended to account primarily for upgrading and for shifts from lower to higher productivity services.

Approximately the same methodology was used in projecting services as in estimating the past growth of services. Consistency with US Department of Commerce methodology could not be attained. In the US the growth of private services is measured by deflating the value of output series to constant prices, while the growth of government services is measured by the growth of government employment; increases in labor productivity, therefore, affect the movement of US private services, but not the movement of government services. Since the bulk of measurable services in the USSR are performed by government employees, it is impossible to use US methodology without imparting a severe downward bias to the computed growth of the service sector. This is one of the reasons for using a mixture of input and output indicators to estimate the growth of services in the USSR.

APPENDIX A

ALTERNATIVE CALCULATION SOVIET GNP, 1960-1975

An independent calculation of the future size and composition of Soviet GNP was made on the basis of projections of the labor force and output per man-year. While this approach is conceptually simpler than using a Cobb-Douglas type function, it is not necessarily more parsimonious. Any calculation of future growth rates involves making various assumptions; whether these assumptions are many or few is perhaps less important than whether they are reasonable. The results obtained in this independent calculation are remarkably close to those presented in the main body of this report, but this agreement on the magnitude of Soviet GNP in the period 1960-1976 does not imply that the two methods confirm each other. The most that can be claimed is that the assumptions in both cases are equally reasonable.

A comparison of the composition of Soviet GNP in the two cases shows certain differences in detail, though not in the general structure of the Soviet economy. These differences are well within the margin of error that must be associated with any long-range projection. Accordingly, the alternative figures presented in Tables A-1 and A-2 should be thought of not as a cross-check on those presented in the main report or as defining the limits of this margin of error. At best, they merely indicate the direction in which the latter figures might be changed and still remain quite reasonable. Whether either set of figures approximates the truth may very well be still open to debate during the Soviet Tenth Five Year Plan.

TABLE A-1

SOVIET GNP BY SECTOR OF ORIGIN, AT RUBLE FACTOR COST, 1960, 1965, 1970, and 1975

	1960	1965	1970	1975
A. Billion 1958 Rubles				
Agriculture	360.2	407.4	460.8	521.2
Industry, including construction	699.0	1087.5	1672.7	2524.8
Transport and communications	150.4	234.0	359.9	543.3
Trade and services	310.0	386.3	481.3	599.7
TOTAL	1519.6	2115.2	2974.7	4189.0
B. Index (1960 = 100)				
Agriculture	100	113	128	145
Industry, including construction	100	125	155	193
Transport and communications	100	156	239	361
Trade and services	100	156	239	361
TOTAL	100	139	196	276
C. Percent				
Agriculture	23.7	19.3	15.5	12.4
Industry, including construction	46.0	51.4	56.2	60.3
Transport and communications	9.9	11.1	12.1	13.0
Trade and services	20.4	18.2	16.2	14.3
TOTAL	100.0	100.0	100.0	100.0

Table A-2

SOVIET GNP BY END-USE, AT RUBLE FACTOR COST,
1960, 1965, 1970, and 1975

		1960	1965	1970	1975
A.	Billion 1953 Rubles				
	Consumption	834.6	1127.3	1544.0	2109.2
	Investment	462.3	695.3	1045.5	1572.1
	Defense	192.6	257.7	344.8	461.3
	Administration	30.1	34.9	40.4	46.4
	TOTAL	1519.6	2115.2	2974.7	4189.0
B.	Index (1960 = 100)				
	Consumption	100	135	185	253
	Investment	100	150	226	340
	Defense	100	134	179	240
	Administration	100	116	134	156
	TOTAL	100	139	196	276
C.	Percent				
	Consumption	54.9	53.3	51.9	50.4
	Investment	30.4	32.9	35.1	37.5
	Defense	12.7	12.2	11.6	11.0
	Administration	2.0	1.6	1.4	1.1
	TOTAL	100.0	100.0	100.0	100.0

A. Calculation of Total GNP, 1960-1975

1. Labor Force (See Table A-3)

The starting point of the alternative estimate is the recent US Bureau of Census estimate of Soviet total population and number of people in the 16-59 year age group,[1/] which takes account of the official population data published in the new Soviet Handbook. The number of persons of working age (16-59 years) in 1955 and 1960 was compared with the estimated labor force in these two years; the ratio of these two magnitudes was then projected into the future. It was assumed that until the middle of the 1960's, i.e., as long as additions to the working age population are small and the sex ratio continues to be heavily distorted, the participation of the working age group in the labor force would not change preceptibly. Thereafter it would tend to decline, chiefly due to the withdrawal of women from the labor force. If Soviet population and labor force develops as indicated in Table A-3, the 1975 ratio would be similar to Italy's in 1954 (44.1 percent) and considerably above the US ratio (39.9 percent) in 1950.

In recent years no less than half of the total Soviet labor force was employed on the farms. This compares with an average of 27 percent in Western Europe and 13 percent in the US (1950). The US has greatly reduced its agricultural labor force during the past decades, in fact

1/ See Arthur A. Campbell, Estimates and Projections of the Population of the USSR: 1955-1996, US Bureau of the Census, August 3, 1956. OFFICIAL USE ONLY.

TABLE A-3

ESTIMATED POPULATION AND LABOR FORCE, 1955-75 (In millions)

	Population a	Persons 16-59 years old a)	Labor Force b	Ratio col. 3 / col. 2	Ratio col. 3 / col. 1	Agriculture Labor Force d	Ratio col. 6 / col. 3	Non-agriculture labor force (= 1. 3- col. 6)
	1	2	3	4	5	6	7	8
1955	199.4	123.6	106.3	86	53.3	55.5	52.2	50.8
1960	217.7	130.5	112.4	86	51.6	56.7	50.4	55.7
1965	236.2	135.2	114.9	85	48.6	54.0	47.0	60.9
1970	253.5	145.4	117.8	81	46.5	51.3	42.5	66.5
1975	270.5	157.2	121.0	77	44.7	48.8	38.3	72.2

a. Campbell, op. cit. Figures for end of year.

b. Average annual figures. The figures for 1955 and 1960 were derived from Table 4 in US Document S-4, adding forced laborers and armed forces personnel; the figures for later years were computed by using the ratios shown in column 4.

c. Ratio for 1955 and 1960 based on figures in cols. 2 and 3; ratios for following years are assumed. All these ratios are slightly distorted by comparing year-end figures (col. 2) and year-average figures (col. 3).

d. Figures for 1955 and 1960 from Table 4, US Doc S-4; for later years they were computed on the assumption that the agricultural labor force would decline by 1 pereent per annum.

by 1.7 percent per annum between 1920 and 1953 and by 2.6 percent per annum between 1940 and 1953. It is unlikely that the Soviet Government will allow the present state of affairs to continue; efforts to reduce the enormous proportion of farm labor can be expected after 1960, even though no reduction occurs during the Sixth Five Year Plan period. On the other hand, it is recognized that the transfer of additional millions of people into the already overcrowded and still fast-growing cities raises very serious financial and administrative problems. Balancing these two considerations, it is assumed that the USSR would be able to reduce its agricultural manpower by a modest 1 percent per annum, i.e., much less than the US did over the past thirty years. If this assumption is correct, Soviet farm labor would still be close to 50 million in 1975 or 38 percent of the entire labor force. This ratio would not be much below Italy's 1951 ratio of 40 percent and Italy is well-known for its rural overpopulation and for the inefficiency of much of its agriculture.

The labor force outside of agriculture (obtained by subtraction) would rise by 9.3 percent in 1960-65, by 9.2 percent in 1965-70, and by 8.6 percent in 1970-75. It had increased by 9.2 percent under the Fifth Five Year Plan and is expected to increase 10.5 percent under the Sixth Five Year Plan. Thus, the projected increase in the non-agricultural labor force after 1960 is in line with recent historical experience, though somewhat lower than that indicated by the current Five Year Plan.

2. Productivity Rates

Soviet productivity on the farms -- or more exactly, agricultural output per man-year -- increased only 1.5 percent per annum under the Fifth

Five Year Plan. The estimates of agricultural output and labor force for the Sixth Five Year Plan period imply an average annual increase in output per man-year of about 3.2 percent. The increased attention being given to agriculture in the USSR makes this latter increase very probable and if Soviet efforts to bring agriculture closer to modern conditions are reasonably successful a continued rise in productivity should occur after 1960. For the purposes of this calculation, an average annual increase of 3.5 percent was assumed. This may be somewhat generous in the light of Soviet experience to date; however, it is quite modest when compared with the approximately 7 percent per annum achieved by US farmers in the past 15 years.

Output per man-year outside of agriculture rose by 7 percent per year under the Fifth Five Year Plan and is calculated to increase by 6.2 percent under the Sixth Five Year Plan. For the period 1960-75, it was assumed that the rate of growth would continue at slightly over 6 percent per annum. There are several factors in favor of a continuing fast rate of growth: elimination of marginal workers resulting from the declining participation of the population in the labor force; the rising standard of living (including more leisure); better education and training; continued technological improvements, including serious attempts to eliminate obsolescent machinery and equipment. It should also be noted that substantial increases in consumption means that sectors will be greatly developed which are now embryonic or inefficient. Food processing will be improved, consumer durables industries promoted, distribution modernized. In all these sectors a significant increase in output per man-year can be expected.

3. Total GNP and Breakdown by Sectors of Origin

The product of the estimated labor force and output per man-year gives, of course, total output. The agricultural component of GNP was then calculated directly from the subsidiary estimates mentioned above; the same was done for the non-agricultural sectors as a whole. The resulting figures show an average annual increase in agriculture of about 6 percent, in non-agricultural sectors about 8 percent, and in the total GNP about 7 percent. The non-agricultural output was broken down on the assumption that services would continue to increase at the same average annual rate as during 1950-60, viz. 4.5 percent; in the remainder, the transportation-communication sector was assumed to grow at the same pace as the industry-construction sector.

B. Breakdown by End-Use.

A breakdown of total GNP by end-use was obtained by assuming growth rates for defense and administrative expenditures, computing investment on the basis of a rising capital-output ratio, and deriving consumption as a residue. This procedure differs from that used in the estimate presented in the report proper, but is neither more nor less reliable. Indeed, for certain purposes it would be just as sensible to derive defense expenditures as a residue and calculate the other sectors by any of the combinations of assumption and estimation that seemed appropriate.

1. Defense

Defense expenditures were increased by a straight 6 percent per annum. This is rather high but -- quite apart from the price relations problem -- it must be recognized that modern weapons technology is ex-

tremely expensive and that personnel costs would tend to increase in line with the over-all level of living standards.

2. Administration

Administrative outlays were raised by only 3 percent per annum, i.e., twice as fast as the population growth. This may be an understatement, but the magnitudes involved remain so small that the over-all use pattern would not be influenced by a much greater increase in administrative expenditures.

3. Investment

The analysis by sectors of origin indicates that the Soviet GNP will increase 2.7 times in the 15 years between 1960 and 1975. The implied rate of growth of 7 percent per annum presupposes a specific degree of investment; a lesser amount would not suffice to raise the GNP by 7 percent, a greater amount would produce a higher rate of growth. The amount of investment needed depends, in turn, on the efficiency of capital.. The estimates for 1950-1960 show that the incremental capital-output ratio (ICOR) during the Fifth Five Year Plan was 3.8, i.e., the USSR had to invest in the course of five years 1,180 billion rubles in order to raise the GNP by 314 billion; the forecast for the Sixth Five Year Plan implies an ICOR of 4.4. For the 1960-1975 period, it is estimated that the ICOR will continue to increase (specifically to 5.0 and ultimately to 5.5) and hence that the efficiency of capital will decline. This implies that the gross investment will rise at a faster rate (8.5 percent per annum) than the GNP.

There are at least four circumstances that tend to lower Soviet capital efficiency. The first is the shift in labor-capital input; the slower growth of the labor factor as compared to the capital factor tends to produce diminishing returns. The second is the increasing share of capital replacements in gross investment as the capital stock grows, particularly if obsolescent equipment should be more rapidly discarded than up to now. The third factor is the unavoidable shift from investment in industrial plant equipment to less productive investments in housing, public utilities, roads, and the like in order to relieve present overcrowding in the cities and to accommodate the increase of the urban population. This would be particularly necessary if the city population is swelled not only by its own growth but also through migration from the countryside. Larger investments in agriculture than would be required with a stable agricultural labor force also tends to lower the efficiency of Soviet capital, but this effect may be offset by the greater productivity of workers shifted from farm to factory. Fourthly, the program of developing Soviet Asia that will occupy Soviet energies in the next decades seems to yield smaller returns than investments in the West. This is to some extent normal. A newly settled area has, as a rule, a more unfavorable ratio of investment to output than a fully developed area; there are more unfinished projects in the new region (e.g., in the form of large dams and power stations under construction) and the facilities (e.g., railroads) may as yet be insufficiently utilized. But the ratio of investment to output for Siberia may also indicate something else, namely, a faulty investment policy, faulty at least from a purely economic point

of view.

These considerations support the estimated increase in the ICOR, but obviously do not preclude the possibility that the future ICOR may be different than that specifically assumed. For example, the ICOR could remain unchanged (viz. 4.4), but in this case either gross investment would increase less rapidly or the GNP would increase more rapidly. The former consequence tends to run counter to present indications of Soviet investment policy; the latter consequence tends to yield long-range growth rates that are more incredible than the 7 percent estimated. Similarly, the ICOR could also be higher and hence Soviet capital even less efficient than that implied by the present estimate. But this seems unlikely since in many fields which the USSR has neglected in the past but will have to develop in the future (e.g., agriculture, construction, manufactured consumers' goods, distribution), technological and organizational factors should to some extent counteract the overall decline in capital efficiency. Moreover, any credible growth in GNP coupled with an ICOR as high as 7 implies that the USSR in 1975 would be devoting half its natural product to investment and presumably reducing per capita consumption below its present level.

4. Consumption

Aggregate consumption, obtained as a residual, rises by about 6-1/2 percent per annum, i.e., by 5 percent per capita. This represents a very considerable improvement in living conditions, particularly in view of the accompanying investment in housing and civic facilities.

But given the general rate of growth, this increase in consumption is an unavoidable concomitant. If the growth of consumption were artificially kept at a lower rate, and military expenditures did not skyrocket, then investment would grow correspondingly faster and the forecaster would be stuck on one of the horns of the dilemma previously mentioned.

C. Concluding Remarks

The picture that this forecast unfolds is impressive. It is that of a country that is expected to grow steadily* and at a rapid rate over a long period of time. And not only will the producers' goods sector expand but consumers' goods output -- i.e., chiefly the output of manufactured consumers' goods -- will rise at a rate that should be highly satisfactory to the Soviet people.

However, while it would be dangerous to underestimate the Soviet growth potential, it seems equally dangerous to compare the projected rate of a 7 percent per annum with the American long-range rate of 3-3-1/2 percent. The US estimates are conservative and extrapolate series based on GNP computations that tend to understate our progress; the Soviet projection leans in the opposite direction. In addition, neither the US nor the Soviet forecast make an allowance for the influence of changing scarcity relations. Both are in present prices; in current prices or in the prices of the

* While business cycles of the Western type are ruled out, the USSR is also experiencing occasional "recessions" due to shifts in planning or faulty programming such as the one of 1953 when the national income according to the official series rose by only 4 percent.

terminal year the gap between the growth rates would be considerably smaller. Any attempt to measure this gap in meaningful terms is beyond the scope of this report -- and perhaps even beyond the ability of imaginative soothsayers.

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